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$$V=8.\tfrac{125}{8}.abc.\frac{[\Gamma(\frac{5}{2})]^3}{\Gamma(\frac{17}{2})}=\frac{20.\pi}{3.7.11.13}.abc.$$

II. Solution by S. G. BARTON, Ph. D., Clarkson School of Technology, and V. M. SPUNAR, Chicago, Ill.

The solid is evidently symmetrical with respect to the axes.

Solving, we find $z=c\left[1-\left(\frac{x}{a}\right)^{\frac{2}{5}}-\left(\frac{y}{b}\right)^{\frac{2}{5}}\right]^{\frac{5}{2}}$.

When $z=0$, $y=b\left[1-\left(\frac{x}{a}\right)^{\frac{2}{5}}\right]^{\frac{5}{2}}=w$, for brevity; then

$$z=c\left[\left(\frac{w}{b}\right)^{\frac{2}{5}}-\left(\frac{y}{b}\right)^{\frac{2}{5}}\right]^{\frac{5}{2}}=\frac{c}{b}[w^{\frac{2}{5}}-y^{\frac{2}{5}}]^{\frac{5}{2}}.$$

$$V=8\int_0^a dx\int_0^w\frac{c}{b}[w^{\frac{2}{5}}-y^{\frac{2}{5}}]^{\frac{5}{2}}dy.$$

Let $y=w\sin^5\theta$, $dy=5w\sin^4\theta\cos\theta\, d\theta$.

$$V=\frac{40c}{b}\int_0^a dx\int_0^{\frac{1}{2}\pi}w^2\cos^6\theta\sin^4\theta\, d\theta=\frac{40c}{b}\int_0^a w^2dx\ \left[\frac{\sin^5\theta\cos^5\theta}{10}\right.$$

$$\left.+\tfrac{1}{256}(3\theta-\sin4\theta+\frac{\sin8\theta}{8})\right]_0^{\frac{1}{2}\pi}=\tfrac{60}{256}\frac{c}{b}\pi\int_0^a b^2\left[1-\left(\frac{x}{a}\right)^{\frac{2}{5}}\right]^5dx$$

$$=\tfrac{60}{256}.\frac{256}{7.9.11.13}\pi\, abc=\frac{20\pi\, abc}{3.7.11.13}.$$

Also solved by J. Scheffer and the Proposer.

MECHANICS.

251. Proposed by J. G. ROSE, B. A. (Oxion), Mt. Angel College, Oregon.

ABC is a uniform triangular lamina of weight $3W$ such that $AB=2AC$. A particle of weight W is attached to it at C. Show that if the lamina be suspended from angle A, it will rest with AB and AC equally inclined to the vertical.

Solution by J. EDWARD SANDERS, U. S. Weather Bureau, Columbus, Ohio.

Draw the median AOD, AO being two thirds of AD, the vertical AP, P and D on BC, and OE and CF, perpendicular to AP. Let $AC=b$, $AB=2b$, $\angle CAB=\alpha$, $\angle CAD=\theta$, and $\angle CAP=\phi$.

Now $BC^2=AC^2+AB^2-2AC.AB\cos\alpha=5b^2-4b^2\cos\theta$.
$\therefore CD=\frac{1}{2}b\sqrt{(5-4\cos\alpha)}$, and $4AD^2=2(AC^2+AB^2)-BC^2$
$=5b^2+4b^2\cos\alpha$.
$\therefore AD=\frac{1}{2}b\sqrt{(5+4\cos\alpha)}$, and $AO=\frac{1}{3}b\sqrt{(5+4\cos\alpha)}$.

Also $\cos\theta=\dfrac{AC^2+AD^2-CD^2}{2AC.AD}$

$$=\frac{b^2+\frac{1}{4}b^2(5+4\cos\alpha)-\frac{1}{4}b^2(5-4\cos\alpha)}{2b.\frac{1}{2}b\sqrt{(5+4\cos\alpha)}}=\frac{1+2\cos\alpha}{\sqrt{(5+4\cos\alpha)}}.$$

$\therefore \sin\theta=\dfrac{2\sin\alpha}{\sqrt{(5+4\cos\alpha)}}$.

Since the uniform weight, $3W$, acts at the centroid O, we have, by taking moments about A,

$$W.b\sin\phi=3W.\tfrac{1}{3}b\sqrt{(5+4\cos\alpha)}\sin(\theta-\phi).$$

$\therefore \sin\phi=\sqrt{(5+4\cos\alpha)}\sin(\theta-\phi)$.
$=\sqrt{(5+4\cos\alpha)}(\sin\theta\cos\phi-\cos\theta\sin\phi)$
$=2\sin\alpha\cos\phi-(1+2\cos\alpha)\sin\phi$
$=2\sin\alpha\cos\phi-2\cos\alpha\sin\phi-\sin\phi$
$=\sin(\alpha-\phi)$.
$\therefore \phi=\frac{1}{2}\alpha$.

Also solved by J, Scheffer and S. G. Barton.

NUMBER THEORY AND DIOPHANTINE ANALYSIS.

Edited by Dr. G. E. Wahlin, University of Illinois.

174. Proposed by B. KRAMER, Student, University of Pittsburg, Pittsburg, Pa.

Find a general solution of $x(x+a)=y^2$, a, x, and y being integers. Given a, required to find x to satisfy conditions.

II. Solution by E. B. ESCOTT, Ann Arbor, Mich.

The solution by Prof. F. L. Griffin is defective. His statsment that $\dfrac{n^2}{a-2n}$ is integral only when n is a multiple of $a-2n$ is not true.

For example, if $a=15$, $n=3$, $\dfrac{n^2}{a-2n}=1$, but $\dfrac{n}{a-2n}=\frac{1}{3}$.